Kildorais

[NG 468 714]

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Introduction

The youngest Jurassic strata to crop out on the Isle of Skye are of Kimmeridgian age. They form the uppermost part of a *c.* 130 m thick, argillaceous unit (of Callovian to Kimmeridgian age) known as the Staffin Shale Formation (Turner, 1966). The Kimmeridgian beds are best exposed in scattered outcrops between low and high water marks on the east coast of the Trotternish peninsula on the northern arm of Staffin Bay beside the stretch of sea known as 'Poldorais'. They are much disturbed by faulting, landslip and igneous intrusions. The strata are steeply dipping, and the outcrops are, at the time of writing, much obscured by basalt boulders and seaweed. Detailed mapping and careful correlation of thin impersistent concretionary limestone bands between faulted blocks is necessary in order to piece together the succession. Nevertheless, because the beds yield zonally diagnostic ammonite faunas from the Oxfordian–Kimmeridgian boundary succession, they have been considered as a candidate for the basal Kimmeridgian GSSP (Page and Cox, 1995). The presence of Middle–Upper Jurassic shales on this stretch of coast was reported by MacCulloch (1819), Murchison (1829a), Forbes (1851) and Judd (1878), and later by Lee and Pringle (1932) and MacGregor (1934). Detailed geological mapping undertaken in the 1930s (Anderson and Dunham, 1966) has formed a basis for subsequent work. The Kimmeridgian GCR site known as 'Kildorais', which coincides with the northernmost part of the Oxfordian GCR site known as 'Staffin' (this volume) (Figure 5.14), is the foreshore shown by Anderson and Dunham (1966, fig. 11) and Wright (1973, fig. 3; 1989, fig. 5).

Description

The following composite section (Figure 5.19) is based on that recorded by Wright (1989) and by Morton and Hudson (1995) with some additional ammonite records from Wierzbowski and Matyja (pers. comm.) and J.K. Wright (pers. comet.). It is best seen in Exposures F5 and F6 of Wright (1973, 1989), north of the large boulder (see (Figure 5.17) and (Figure 5.18)). Bed numbers are those of Wright (1989) and are an upward continuation of those given for the Oxfordian and basal Kimmeridgian beds by Sykes and Callomon (1979). The subdivision of the Staffin Shale Formation into members follows Sykes (1975).

	Thickness (m)
Staffin Shale Formation	
Flodigarry Shale Member	
45. Clay, dark grey, poorly fossiliferous; *Rasenia* cf. *evoluta* Spath and *Amoeboceras* cf. *cricki* (Salfeld) seen	9.0
44. Sandstone, argillaceous, tough, forming distinct ridge running across rock platform	0.15
43. Clay, pale grey, poorly fossiliferous; occasional *A. cricki* and *R.* cf. *evoluta*	4.5
42. Clay, darker than beds 41 and 43, silty; numerous *A. cricki* together with *Amoeboceras bayi* Birkelund and Callomon preserved in iridescent calcite	0.4
41. Clay, pale grey, silty; crushed *A. bayi, A. cricki* and *Pictonia* sp.	1.5
40. Limestone; continuous bed, locally as nodules	0.15–0.45
39. Clay, grey, silty; A. aff. *bayi* and *Pictonia* sp.	0.85

38. Clay, black, shaly; abundant white, crushed ammonites including *Amoeboceras bauhini* (Oppel), *Pictonia* sp. and *Prorasenia* sp.	0.65
37. Clay, grey, silty; blocky fracture and abundant *A. bauhini* in highest 0.3 m; *A. bauhini* and *Pictonia densicostata* (Salfeld) in lowest 4.2 m with *A. rosenkrantzi* Spath in lowest 2.0 m	4.7
36. Limestone nodules/concretions	0.07–0.25
35. Clay, medium to dark grey, silty, slightly bituminous; abundant *Amoeboceras marstonense* Spath, *A. rosenkrantzi, Ringsteadia frequens* Salfeld and *Ringsteadia evoluta* Salfeld in highest 1–2 m	6.0

The main markers are the variably persistent limestones (Bed 36 and Bed 40), and the distinctive black clay with white 'chalky' ammonites (Bed 38) (Figure 5.19). Small faults running predominantly NW–SE, but also NE–SW, dissect the outcrops. All authors have concentrated on the ammonite faunas, and there are few records of other fossils. In his unpublished thesis, Morris (1968) reported the bivalves *Neocrassina ovata* (Wm Smith) and *Nuculana,* gastropods (*Dicroloma* and *Procerithium*) and belemnites (abundant in the highest part of Bed 43 and the lowest part of Bed 45). Callomon (pers. comm., 1982) recorded belemnites in beds 37–43. The marine palynomorph floras have been investigated by Riding and Thomas (1997).

Interpretation

The bio- and chronostratigraphical classification and correlation of these steeply dipping and variably exposed beds has been difficult, although the fact that they included an ammonitiferous succession across the Oxfordian–Kimmeridgian stage boundary has long been recognized. Sykes and Callomon (1979) based their ammonite zonation of the Boreal Oxfordian nearby at Digg (see site report for Staffin, this volume) and placed its upper boundary at the base of Bed 39. Subsequently, in the spring of 1982, the beds at Digg were unusually well exposed, which enabled their classification to be reassessed. As a result, the Oxfordian–Kimmeridgian stage boundary was lowered to the base of Bed 37 (Birkelund and Callomon, 1985). The key ammonite for marking the basal Kimmeridgian (Baylei Zone) in the section is *Pictonia densicostata;* its occurrence with *Amoeboceras bauhini,* previously thought to belong to the youngest Oxfordian, led to the removal of the Bauhini Subzone from the Upper Oxfordian Rosenkrantzi Zone, which consequently, at present, has no subzones. Although small in size (25 mm maximum), Birkelund and Callomon (1985) regarded it as a macroconch with the even smaller *A. cricki* as the associated microconch. The base of the Cymodoce Zone, the youngest zone proven here, is taken at the base of Bed 43. Although poorly fossiliferous, the presence therein of occasional well-preserved *Rasenia* is indicative of the zone. Contrary to the earlier views of Wright (1973), there is no substantive evidence of the Mutabilis Zone, and certainly none for the Eudoxus Zone (Wright, 1989). Ammonites previously recorded as *Xenostephanus* are now considered to be coarsely ribbed variants of *Rasenia evoluta* but the horizon from which the supposed *Xenostephanus* figured by Arkell and Callomon (1963, pl. 33, N. 1) came is uncertain (Wright, 1989).

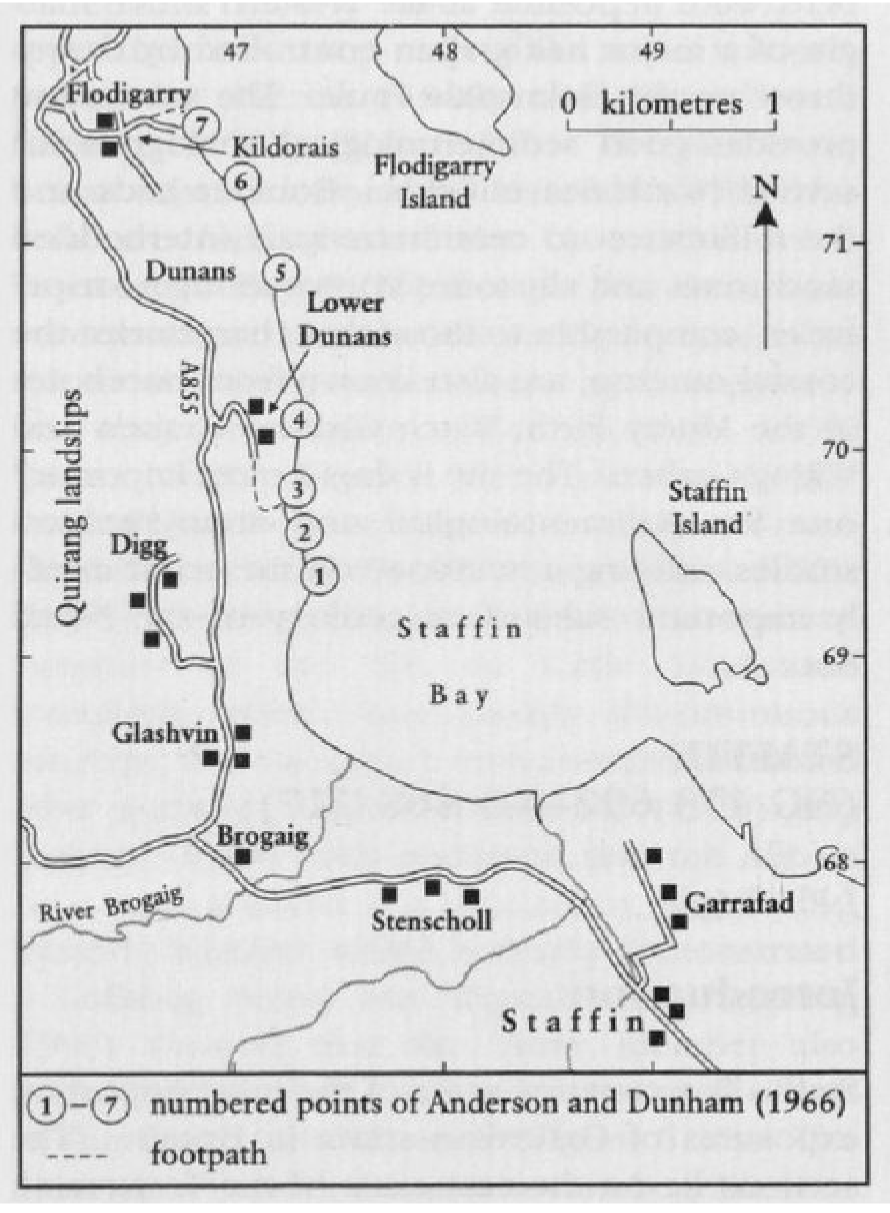
According to Wright (1989), the Quirang landslip has had a marked effect on the attitude of the beds. Oversteepening of the westward dip due to eastward pressure from the landslip has produced complex exposures with steep dips and numerous faults; at Kildorais, dips typically increase westwards from 45° to 90°. Wright (1989) believed that some rotational movement, associated with the landslip, had to be invoked in order to account for the change in dip. The faults are mainly slip planes associated with the soles of the rotated landslip blocks (Morton and Hudson, 1995). Normal faulting of probable mid-Tertiary age is recorded in the older Oxfordian rocks of this area (Anderson and Dunham, 1966). The latter authors had already suggested that pressure from the Quirang landslip would cause thrusting in the Flodigarry Shale. Vertically dipping beds are displaced laterally along complementary strike-slip faults at approximately 45° to the pressure from the west. Blocky fracture, shear planes, slickensides, and distortion of ammonites including, in the highest beds, complete flattening of specimens so that they are unrecognizable, are all common features that are indicative of the intense pressure to which the beds have been subjected. Variation in the details of the stratigraphy in different blocks suggests that strata, which were originally deposited some little distance apart, have been brought into juxtaposition owing to the effects of the landslip (Wright, 1989). These are also responsible for slight thickness variations in the different fault blocks.

Conclusions

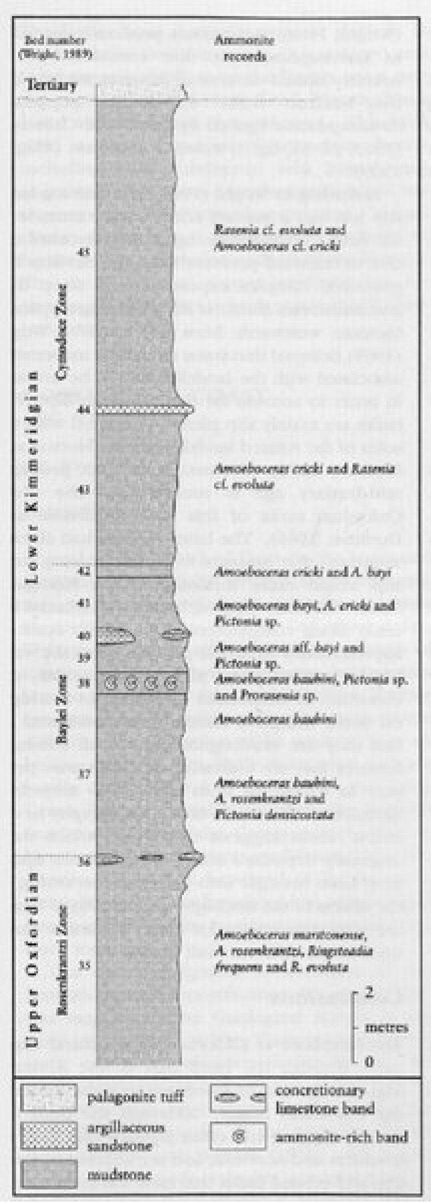
The foreshore at Kildorais offers natural exposures through the basal part of the Kimmeridgian Stage and its boundary with the underlying Oxfordian Stage. Although the beds are steeply dipping and often partially obscured by boulders and seaweed, and are affected by landslip and related faults that have led to misclassification in the past, the sections provide a fuller succession through the basal Kimmeridgian boundary beds than anywhere else in Britain.

The Baylei Zone is nearly twice as thick as at South Ferriby (see site report, this volume) and three times as thick as on the Dorset coast (see site reports for East Fleet–Small Mouth, Black Head and Ringstead, this volume). The beds yield a good sequence of ammonite faunas including both Sub-Boreal and Boreal taxa (notably *Pictonia* and *Amoeboceras*), which are important for international correlation. In particular, the species *A. baubini* is considered to be the key to correlation with southern Europe. The site is therefore a most important one for stratigraphical studies in both national and international spheres.

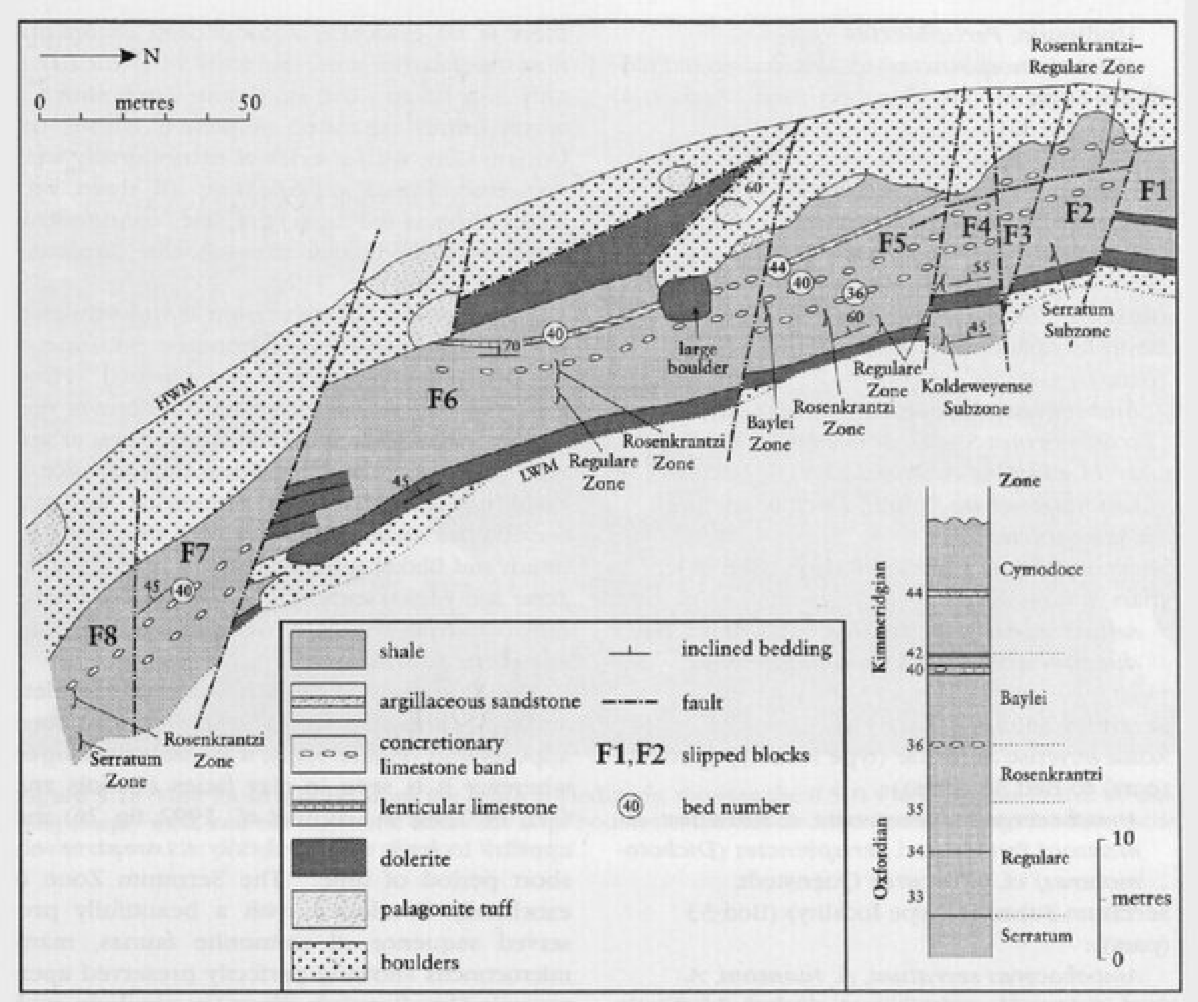
References



(Figure 5.14) Locality map of the Staffin and Kildorais GCR sites (after Cox and Sumbler, in press).



(Figure 5.19) Graphic section of the Kimmeridgian and uppermost Oxfordian parts of the Staffin Shale Formation, Flodigarry Shale Member, at Kildorais.



(Figure 5.17) Map of the foreshore at Flodigarry, with detailed log (after Morton and Hudson, 1995, fig. 42).

(Figure 5.18) View looking north along the beach at Flodigarry, showing the 0.3–0.4 m limestone of Bed 40 dipping steeply west, and curving round under the large boulder in the middle distance. The large boulder is the one in the middle of (Figure 5.17). (Photo: J.K. Wright.)